Public Works (1908.) Department.

G.O., No. 2269/227

DATED 17-6-1908.

The Notes in this G.O. have been printed.

[Despatch Abstract.]

Periyar-Pambiyar Investigation. Passing orders on the Report showing the results of the —— and directing that further investigation be deferred, that the gaugings of the Pambiyar river be continued and that a copy of the Proceedings be forwarded to the Govt. of India for information.

Periyar-Pambiyar Investigation. Forwarding to the Govt. of India for information a copy of the Proceedings passing orders on the Report showing the results of the ——.

Indexed.

18/6/08 Tr/Br

IRRIGATION.

Government of Madras.

PUBLIC WORKS DEPARTMENT.

Recd. } 1908. *Enclosures*

Regd. *Spare copies*

G.O., Nos. 226, 227 I., 17th June 1908.

Periyar-Pambiyar Investigation

Forwarding to the Government of India for information a copy of the Proceedings passing orders on the report showing the results of the —.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following papers:—

I

G.O., No. 702 I., dated 27th June 1906.
„ „ 280 I. „ 18th „ 1907.

II

Letter—from S. B. MURRAY, Esq., Executive Engineer, Periyár-Pambiyár Investigation.

To—the Chief Engineer for Irrigation.

Dated—Kumili, Travancore, the 3rd March 1908.

No.—125.

As requested in your demi-official letter, dated 24th February 1908, I have the honour to submit a report on the work of the party during the present working season.

For the last two months the weather has been fine, and we have devoted the whole of our time to field work, leaving the plotting to be done when the rain begins. I have in consequence not seen the results of our work on paper, and so am unable as yet to form any definite conclusion as to the prospects of the scheme. All I can say at present is that water can be diverted from the Pambiyár river into the Periyár lake, that the Pambiyár is usually in flood at the same time that the Periyár is, so, to get full advantage of the Pambiyár water, it should be stored, and that a considerable volume of water can be so stored. Beyond this I am not now prepared to commit myself. I have yet to calculate the quantity of water at our disposal in the Pambiyár—to be taken from last season's gaugings—, the capacity of the sites I have selected as storage reservoirs, and I have still to lay out the line of the tunnel, and measure its length on the ground. Until I have done all this I can make no attempt to forecast the cost of my proposals.

I regret the baldness and incompleteness of my report, but at this stage of my work I do not see what more I can say.

ENCLOSURE.

Report.

At the end of last working season I was able to approximately decide on the best way to divert water from the Pambiyár river into the Periyár lake—see paragraph 6 of my report in G.O., No. 280 I., dated 18th June 1907. I have now definitely settled how this should be done, and detailed surveys are being made, to enable the scheme to be worked out.

1. A site for a dam across the Pambiyár has been selected, and a trench is being dug along the line, down to rock level. Sections up the river above this site are being taken for the calculation of the storage capacity of the river valley.

2. A site for a dam across the Meenár has yet to be chosen. This river valley is very narrow and steep, and I am going to omit consideration of its storage capacity.

3. I have fixed on the starting point of the tunnel which will have to be made from the Meenár valley to the Kullár valley, and also where it will end. I have not yet cleared the line of the tunnel—nearly all in heavy jungle—so can only, at present, take its length from my map. This length I make 3¼ miles.

4. A site for a dam across the Kullár river has been found, and the earth is being cleared down to rock level. The field work for the calculation of the capacity of a reservoir above this dam has been done.

5. I am going to trace the course of the Pambiyár river to its source, if possible, this month.

S. B. Murray,
Executive Engineer.

3rd March 1908.

III

Memorandum No. 1274, dated 23rd March 1908.

Telegram from the Executive Engineer, Periyár-Pambiyár Investigation Party, dated 10th April 1908.

To the Executive Engineer, Periyár-Pambiyár Investigation Party, dated 19th April 1908, No. 3 O.

From the Executive Engineer, Periyár-Pambiyár Investigation Party, dated 28th April 1908, No. 140.

From the Executive Engineer, Periyár-Pambiyár Investigation Party, dated 28th April 1908, No. 141.

IV

Letter—from S. B. Murray, Esq., Executive Engineer, Periyár-Pambiyar Investigation.

To—the Chief Engineer for Irrigation.

Dated—Madras, the 1st May 1908.

No.—142.

I have the honour to place before you my report on the work done by the party during the present season.

It is unfortunate that the decision that the proposed tunnel is prohibitive was not received by me earlier. I got it on the 30th March, *i.e.*, after the party had been at work for five months. If I had received it at the beginning of the season, instead of at the end, I could have found other and more useful work for the party than that which has now been done.

Enclosures.

Report.

As a result of last year's work it was ascertained that the level of the Pambiyár river would admit of water being diverted from that river into the Periyár lake, and, after a thorough examination of the country, a line for such a diversion was decided upon. Any line between the Pambiyár river, and the Periyár lake must cross very steep and difficult country, and be right across its drainage. In the line selected it was found that three large works would be necessary. These are (1) a dam across the Pambiyár river, above which the diversion channel would start, (2) a tunnel from the valley of the Meenár river to the Kullár valley, (3) a dam across the Kullár valley—see paragraph 7 of the report printed with G.O., No. 280 I., dated

18th June 1907. Further examination of the country this year has confirmed the selection of last year's line, and has proved that all the above works are necessary if water is to be taken from the Pambiyár river to the Periyár lake.

2. At the end of paragraph 7 of the report referred to above a programme for the work which it was proposed to carry out in the working season of 1907–1908 was given, and, as, at the beginning of the season, no exception had been taken to this programme work was begun on these lines.

Kullár dam and reservoir.—A suitable site for a dam across the Kullár river was found without much difficulty, and, after the jungle had been cleared, and several trial sections taken, a line was finally settled. A cross section of the river along this line is shown on sheet No. 2. The river-bed at this place is very hard sheet rock, the right bank rises very rapidly, and on the left flank there is a suitable site for an escape. Except just across the river, and at the escape, the dam could be made of earth. On both banks the soil is a hard, yellow, sandy clay, which would make an excellent material to build a bund with.

A number of sections along and across the Kullár valley, above the dam site, were taken, and, from these levels, contours were drawn to ascertain what quantity of water would be held up by the dam. A table of capacities is given in statement (1) which accompanies this report.

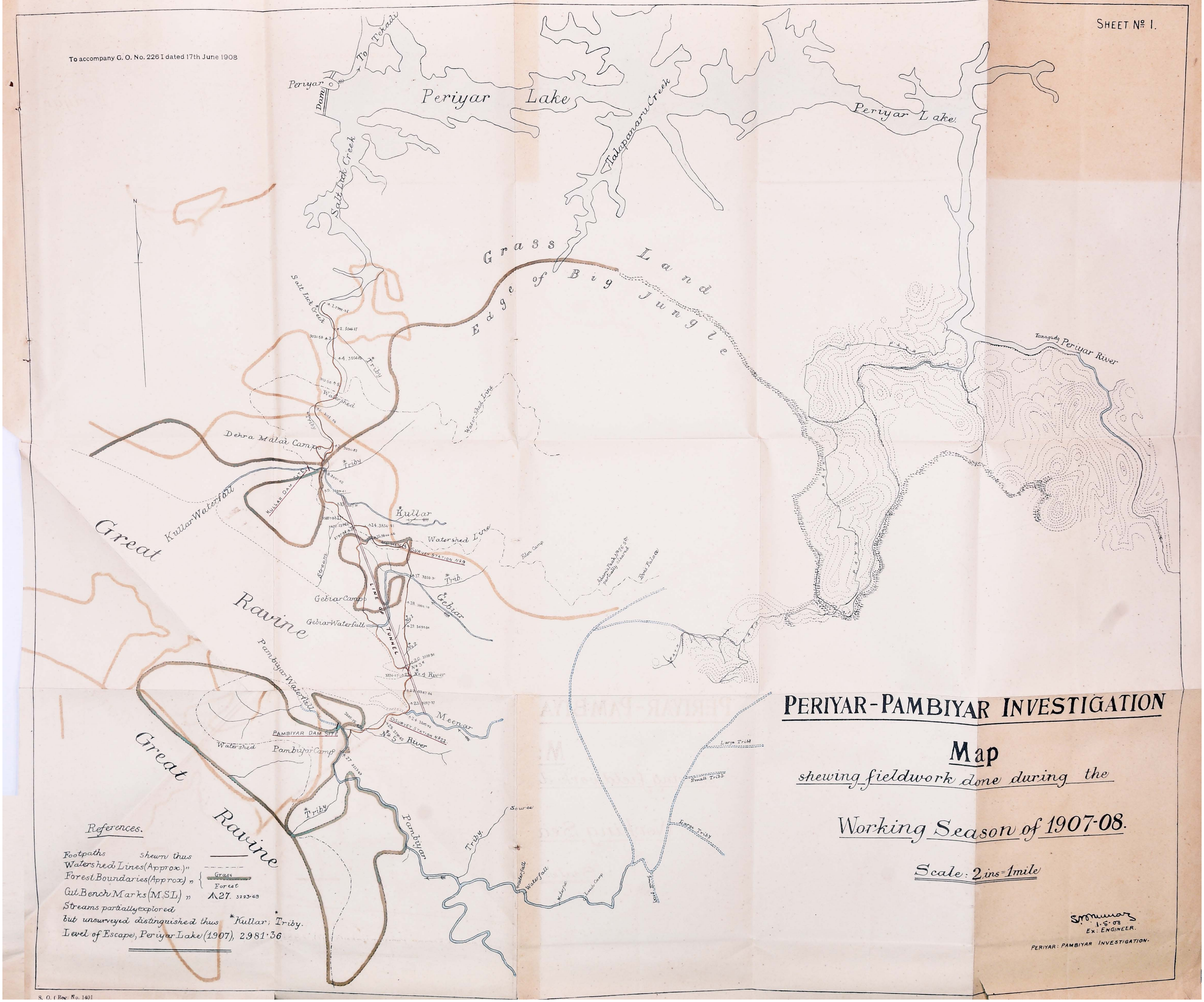
When these sections were taken it was found that there was a very low saddle between the Kullár valley and the source of a stream, known as the "Salt Lick Creek" which runs into the Periyár lake. The lowest point on this saddle is only 55 feet above the bed of the Kullár river at the site chosen for the dam, so, even without any cutting down of the saddle, it would be an easy matter to divert Kullár water into the Periyár lake.

A survey of the Kullár river was also part of the programme, and an attempt was first made to do this by following up the river-bed. This, however, was found to be very slow, and difficult work, owing to the numerous waterfalls on the river, and the steepness and roughness of its bed, so it was decided to make a watershed trace all round the catchment instead. This too had to be stopped because of the impenetrable jungle which was met with, and the cutting through of which demanded more time than was at the disposal of the Party. The survey of the river-bed and the watershed lines, so far as they were taken, are shown on the map. As the watershed lines on the north and south have not been joined up, for the reason given above, it would not be safe to draw any deductions from them as to the area drained by the Kullár river.

Pambiyar dam and reservoir.—For almost the whole length of the lower part of its course the Pambiyar river runs through a narrow valley, with hills on both sides rising abruptly to several hundreds of feet above the river-bed. In only one place is there a low level tributary coming in on the right bank. This tributary is called "No. 5 River" on the map, and at the point where it joins the Pambiyár the river-bed is 180 feet above Periyár Full Lake level (+2,989·36). These levels will admit of water being diverted from the river to the lake at this place, so a site for a dam was looked for at this part of the river. About 250 yards below the junction there is a broad barrier of very hard rock right across the river— a splendid site for a dam. A cross section of the river, and three sections down the river, across the barrier are shown on sheet No. 3. To the north of the selected site for the dam there is a low saddle, which could be easily and cheaply converted into an escape. A section along this saddle is shown on sheet No. 2. As was done for the Kullar dam, sections were taken up the valley of the Pambiyár and the storage capacity above the dam, at various levels, ascertained. These capacities are shown in statement (2) accompanying this report.

A branch of No. 5 River starts from a low narrow saddle to the north of survey station No. 22, and quite close to the Meenár river. By means of a low dam on the Pambiyár, at the place already described, and a slight cutting down of this saddle, the lowest point of which is only 50 feet above the bed level of the Pambiyár river at the mouth of No. 5 River, it would be quite easy to put Pambiyár water into the Meenár river, the bed level of which, a little way beyond the saddle, is less than 30 feet above that of the Pambiyár at the mad site.

From the description of the country given above it will be seen that with a dam across the Pambiyár river, and another one across the Kullár water can be taken from the Pambiyár into the Meenár, and from the Kullár into the Periyár lake. The intervening country, however, between the Meenár and Kullár rivers is of a very different nature, and puts the possibility of an open channel between the two rivers entirely out of the question. The valley of the Meenár is, if anything, steeper than that of the Pambiyár and the ground immediately above the river on the right bank, *i.e.* towards the Kullár, is at least 200—300 feet above the river-bed. This high ground extends up to the very edge of the "great ravine", where it ends in what is practically a precipice. This precipice extends almost the whole way round the ravine from the Kullár waterfall to the Pambiyár waterfall, and the depth of the ravine itself must be, at the least 1,000—1,500 feet. Into this huge gorge the Pambiyár, Meenár, Kullár, and other rivers precipitate themselves in a series of high and beautiful falls. The country to



SHEET No. 1.
To accompany G. O. No. 226 I dated 17th June 1908
To Tekadi
Periyar
Dam
Periyar Lake
Talapanaru Creek
Periyar Lake
Salt Lick Creek
Grass Land
Edge of Big Jungle
Salt Lick Creek
Periyar River
Triby
Watershed
Dehra Mala Camp
Water Shed Line
Kullar Waterfall
KULLAR DAM SITE
Kullar
Watershed Line
SURVEY STATION No. 9
Trib
Stream
LINE OF TUNNEL
Gebiar Camp
Gebiar
Gebiar Waterfall
Great Ravine
Pambiyar Waterfall
No. 2
No. 3
No. 4 River
Meenar
PAMBIYAR DAM SITE
SURVEY STATION No. 22
No. 5 River
Watershed
Pambiyar Camp
Great Ravine
Triby
Pambiyar
Triby
Source
Waterfall
Waterfall
Large Trib
Small Trib
Large Trib
References.
Footpaths shewn thus
Watershed Lines (Approx.) "
Forest Boundaries (Approx) " Grass Forest
Cut Bench Marks (M.S.L.) " ∧27. 3223·69
Streams partially explored but unsurveyed distinguished thus *Kullar; Triby.
Level of Escape, Periyar Lake (1907), 2981·36
PERIYAR-PAMBIYAR INVESTIGATION
Map
shewing fieldwork done during the
Working Season of 1907-08.
Scale: 2 ins = 1 mile
1.5.08
Ex: ENGINEER.
PERIYAR: PAMBIYAR INVESTIGATION.
S. O. (Rev. No. 1401

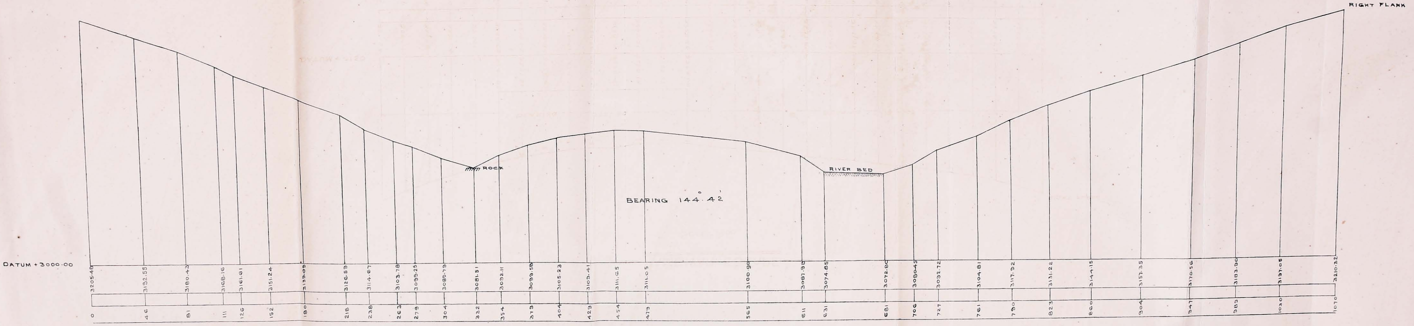
To accompany G. O. No. 226 I dated 17th June 1908.

PERIYAR - PAMBIYAR INVESTIGATION

KULLAR RIVER

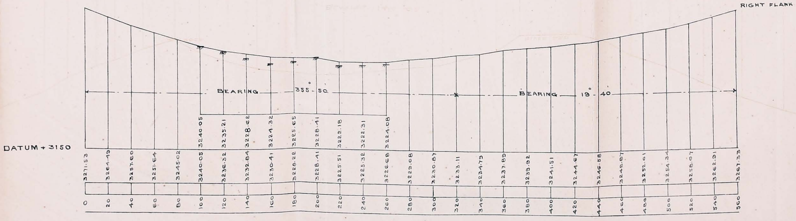
CROSS SECTION OF RIVER AT PROPOSED SITE FOR DAM

SCALE 1/500



PAMBIYAR ESCAPE

SCALE 1/500



S. M. Murray (signature)
1.5.08
Ex: Engineer
Periyar - Pambiyar Investigation.

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PERIYAR-PAMBIYAR INVESTIGATION

SHEET No. 3.

PAMBIYAR RIVER

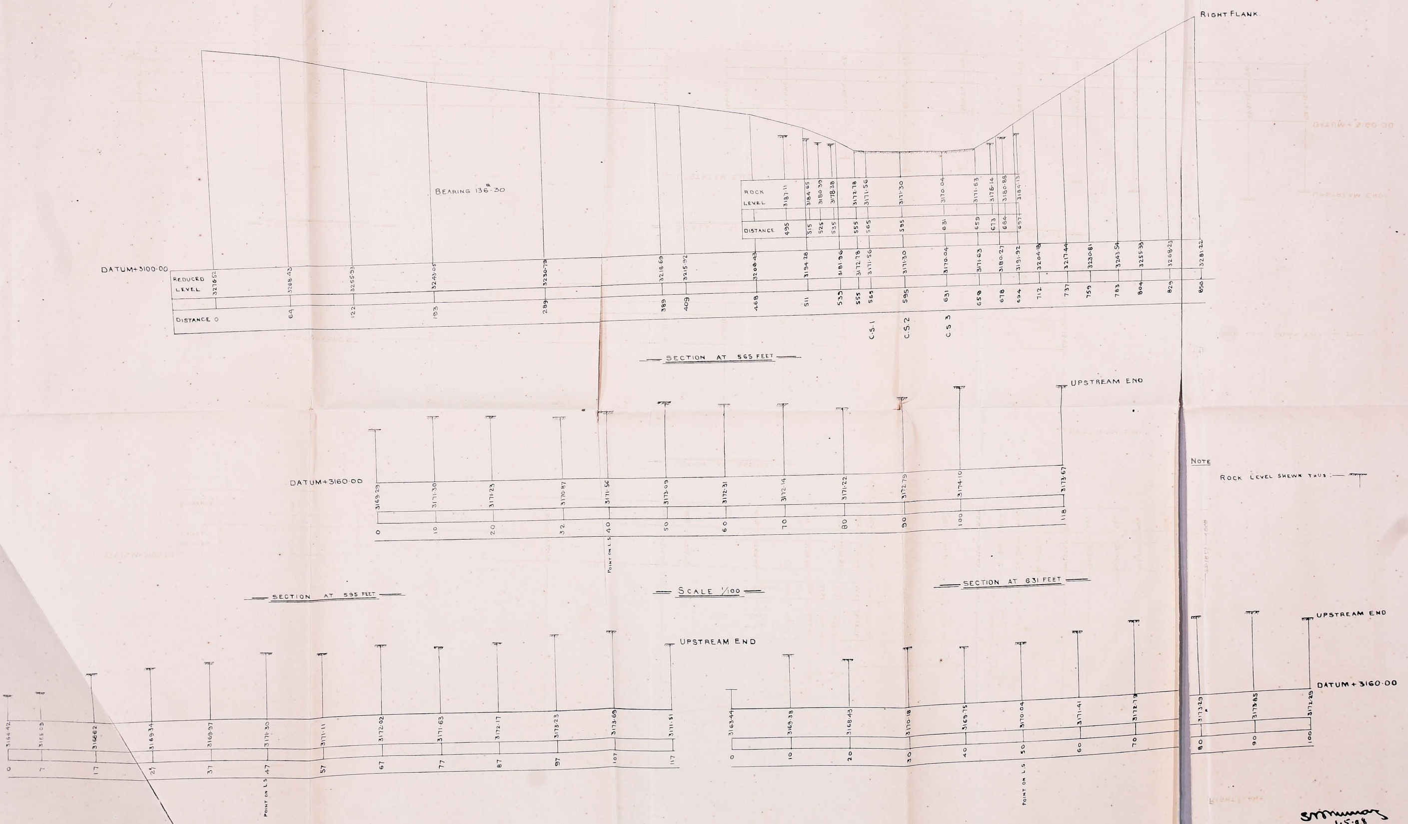
CROSS SECTION OF RIVER

AT

PROPOSED SITE FOR DAM

SCALE 1/500

To accompany G. O. No. 226 I dated 17th June 1908



Ex. ENGINEER 1.5.08

PERIYAR - PAMBIYAR INVESTIGATION

S. O. Reg: No. 1403
1908 Copies – 212

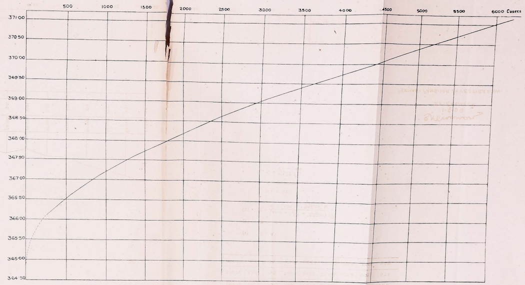
To accompany G. O. No. 226 I
dated 17th June 1908

PAMBIYAR RIVER

FLOOD DISCHARGES CALCULATED BY KUTTER'S FORMULA

DISCHARGE CURVE

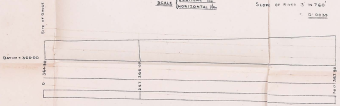
SCALE { VERTICAL $\frac{1}{10}$ FOR WATER LEVELS; HORIZONTAL $\frac{1}{500}$ FOR DISCHARGES IN CUSECS



LONGITUDINAL SECTION UP PAMBIYAR RIVER ABOVE GAUGE

SCALE { VERTICAL $\frac{1}{100}$; HORIZONTAL $\frac{1}{1000}$

SLOPE OF RIVER 3' IN 760' = 0·0039



NATURE OF BED

SHEET ROCK VERY SMOOTH AND REGULAR, NO LOOSE ROCKS, BOULDERS, OR VEGETABLE GROWTH,—COURSE, STRAIGHT.

COEFFICIENT FOR ROUGHNESS (N) IN KUTTER'S FORMULA TAKEN TO BE = 0·025.

LEVEL	AREA OF CROSS SECTION (A)	WETTED PERIMETER	MEAN HYDRAULIC RADIUS (r)	$\sqrt{r}$	C	$\sqrt{rs}$	V	DISCHARGE IN CUSECS (Q)
371·12	600	127·5	4·706	2·169	77·087	·135	10·407	6244
370·62	541·5	122·5	4·420	2·102	76·288	·131	9·993	5411
370·12	485	118·75	4·084	2·021	75·277	·126	9·485	4600
369·62	428	115	3·808	1·951	74·359	·121	8·997	3851
369·12	374	111·5	3·354	1·831	72·683	·114	8·296	3102
368·62	323	107·5	3·005	1·733	71·206	·108	7·690	2483
368·12	275·5	103·5	2·661	1·631	70·299	·101	7·100	1956
367·62	224	101	2·218	1·489	67·037	·093	6·234	1396
367·12	175·5	98·5	1·791	1·338	64·032	·083	5·315	932
366·72	130	95	1·368	1·169	60·186	·073	4·393	571
366·12	84	92	0·913	0·955	54·390	·059	3·209	269

(1) $Q = AV$

(2) $V = C\sqrt{rs}$

(3) $C = \dfrac{\left(41\cdot6 + \frac{1\cdot811}{N} + \frac{\cdot00281}{S}\right)\sqrt{r}}{\sqrt{r} + \left(41\cdot6 + \frac{\cdot00281}{S}\right)N}$

$N = 0\cdot025$

$S = 0\cdot0039$

$\therefore\ C = \dfrac{114\cdot76\sqrt{r}}{\sqrt{r} + 1\cdot06}$

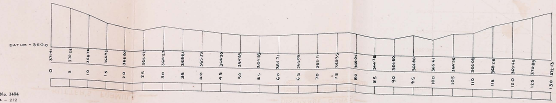
NOTES

THE LEVELS ON THIS SHEET REFER TO THE PERIYAR LAKE GAUGE DATUM. TO CONVERT THEM TO MEAN SEA LEVELS, ADD + 2837·36

THE ZERO POINT OF THE GAUGE IS AT LEVEL + 364·57

CROSS SECTION OF PAMBIYAR RIVER AT SITE OF GAUGE

SCALE $\frac{1}{100}$



S. O. 1908 { Reg. No. 1404; Copies – 212

1·5·08
EX. ENGINEER

PERIYAR - PAMBIYAR INVESTIGATION.

the north of the Meenár continues to rise, until, at a distance of about 2¼ miles, the level is more than 800 feet above the Meenár river. (The line of levels from the Periyár lake to the Pambiyár river, which is shown on the map by a brown line, was taken along a path which traversed the easiest line of country, and crossed all the lowest saddles. There is much higher country on both sides of it.) Near station 9 the summit is reached (B.M. No. 16 +4041·36) and from this point there is a very rapid fall down to the Kullár river.

Tunnel.—From the description of the country given above it is evident that, owing to the high ground between the Meenár and Kullár rivers, and the precipitous drop into the "great ravine," it would be impossible to make an open channel between the two rivers. If there had been any doubt on this point levels would have been taken, but after an inspection of the country the fact is so obvious that it would have only been waste of time to prove it. The only alternative is a tunnel. This was realised last year, and the approximate length and direction of the tunnel was shown on the map which accompanied last season's report. When this line was drawn the Kullár river had been only roughly surveyed, and had not been levelled. A regular theodolite survey, and levels, have been taken this year and the correct course of the river marked on this season's map. It is now found that last year's tunnel line was made to end rather too far up the river. The correct length and direction are now given.

It was intended this year to definitely mark out on the ground the upper and lower ends of the tunnel, to fix these points by triangulation, to calculate the exact length and direction of the tunnel, to clear this line on the ground, and take a section along it. Before this work was completed, Memo. No. 1274, dated 23rd March 1908, was received from the Chief Engineer, for Irrigation, in which it was stated that the Inspector-General of Irrigation (Mr. J. Benton) considered "the line of the tunnel . . . . to be prohibitively expensive if the levels shown on that plan are at all correct". These levels are correct, so, in the face of this decision, it would have been useless to spend any further time on the tunnel line, and work on it was stopped. The length of last year's approximate line was 2 miles, 3,960 feet, while the new, and more correct, one, now drawn, is 1,320 feet longer. As the whole scheme for the diversion of the Pambiyár river water into the Periyár lake depends upon the admissibility of a long tunnel, and as it has now been decided that the proposal is prohibitive, all field work was, on the receipt of this decision, stopped, and such of it as was sufficiently far advanced to admit of it, has been plotted.

Pambiyár river.—At the beginning of the present working season the acting Chief Engineer for Irrigation stated that he attached great importance to as complete and thorough an exploration and survey of the course of the Pambiyár river and its tributaries, as time would permit of. In this way he hoped to be able to get an idea of the approximate area of country drained by the river. To comply with this request two officers of the Party spent a considerable time up the river. They had both done a lot of exploration work, and were just starting a theodolite survey when intimation was received from the Chief Engineer for Irrigation (Memo. No. 1274, dated 23rd March 1908) that the Inspector-General of Irrigation "considers all further attempt to trace rivers to their sources, and so determine the catchment, should be abandoned". Work was accordingly stopped. The upper waters of the Pambiyár which are shown in blue dotted lines on the map represent the explored, but not surveyed, part of the river.

Cost of the scheme.—It was the intention, when submitting the report of the work done during the present working season to, at the same time, give a rough estimate of the cost of the scheme as sketched out at the end of last season, and elaborated this year, but it would be useless to do so now, as the proposed tunnel, and thereby the whole scheme, has been condemned.

Pambiyár river discharges.—Since the beginning of July last year regular gauge readings of the flow in the Pambiyár have been taken, and, from these readings the discharges down the river have been worked out. Kutter's formula was used—see sheet No. 4. In statements 3–7 accompanying will be found the daily discharges from July-November.

Rainfall.—A rain gauge was put up at Pambiyár last September and a register of the rainfall maintained till the 20th of April 1908. The rainfall is given in statement 8 and also in statement 9, a table comparing the fall at Pambiyár, Periyár, and Thekadi.

Bench marks.—All the 27 benchmarks along the track from the lake to the Pambiyár river have been cut in rock, and numbered. A list of the more conspicuous, and easily found ones, is given.

Further investigation.—Except in the grass land all traces of the work of the last two seasons will be obliterated after a very few years, but if in the future there is to be any further investigation, and it is desired to make use of any of the work done in 1906–1907–1908, the local jungle people—Manaans—many of whom have been employed at different times during the last two years, will for a long time to come be able to point out the line of the paths, hills on which survey stations were placed, sites of camps, etc., which were used by the Party working in 1906–1908.

Statement No. 1.

Kullar Reservoir.

Contour.	Area in square feet.	Mean area.	Capacity in millions cubic feet.	Total capacity in millions cubic feet.
3120	4,818,033	5,503,697	55·037	55·037
3130	6,189,360	6,822,644	68·226	123·263
3140	7,455,927	8,091,255	80·912	204·175
3150	8,726,582	9,330,611	93·306	297·481
3160	9,934,640	10,721,835	107·218	404·699
3170	11,500,030	12,167,586	121·575	526·275
3180	12,806,143	13,524,933	135·249	661·524
3190	14,243,723	14,799,568	147·996	809·520
3200	15,355,412		..	..

Statement No. 2.

Pambiyar Reservoir.

Contour.	Area in square feet.	Mean area.	Capacity in millions cubic feet.	Total capacity in millions cubic feet.
3200	1,954,059	2,730,284	27·303	27·303
3210	3,506,508	4,531,722	45·317	72·620
3220	5,556,936	7,699,109	76·991	149·611
3230	9,841,282	11,447,831	114·478	264·089
3240	13,054,380	14,406,239	144·062	408·151
3250	15,758,098	17,288,605	172·886	581·037
3260	18,819,113	..	..	..

Statement No. 3.

Pambiyar river.

GAUGE readings and discharges for the month of July 1907.

Day.	Mean daily reading.	Discharge in cusecs.	Discharge in 24 hours in millions of c. feet.	Zero of gauge = + 364·57.
1st	367·85	1,650	142·5	
2nd	367·83	1,640	141·7	
3rd	367·37	1,150	99·3	
4th	367·01	840	72·5	
5th	366·77	675	58·3	
6th	366·61	571	49·3	
7th	366·23	340	29·4	
8th	366·07	..	..	
9th	365·99	..	..	
10th	365·89	..	..	
11th	365·87	..	..	
12th	365·97	..	..	
13th	366·19	310	26·7	
14th	365·99	..	..	
15th	365·95	..	..	
16th	366·19	310	26·7	
17th	366·07	..	..	
18th	366·27	350	30·2	
19th	367·12	932	80·5	
20th	367·86	2,675	144·7	
21st	368·34	2,175	187·9	
22nd	368·86	2,775	239·7	
23rd	369·33	3,400	293·7	
24th	369·53	3,700	319·6	
25th	369·83	4,400	380·2	
26th	370·12	4,600	397·4	
27th	369·79	4,125	356·4	
28th	369·53	3,700	319·6	
29th	369·07	2,960	255·7	
30th	368·56	2,410	208·2	
31st	368·13	1,960	169·3	
	Total for the month ..		4,029·5	

NOTE.—The "mean daily reading" is the average of four readings taken every 24 hours—at 6 A.M., noon, 6 P.M. and 6 A.M. (the following day).

All days on which the discharge is less than 300 cusecs have been omitted.

Statement No. 4.

Gauge readings and discharges for the month of August 1907.

Day.	Mean daily reading.	Discharge in cusecs.	Discharge in 24 hours in millions of c. feet.	Zero of gauge + 364·57.
1st	367·69	1,452	125·4	
2nd	367·43	1,250	108·0	
3rd	368·11	1,950	168·5	
4th	369·56	3,750	324·0	
5th	370·37	5,000	432·0	
6th	371·02	6,050	522·7	
7th	370·66	5,450	470·9	
8th	370·39	5,025	434·2	
9th	369·54	3,730	322·3	
10th	368·84	2,750	237·6	
11th	369·28	3,350	289·4	
12th	369·51	3,680	317·9	
13th	369·46	3,650	315·4	
14th	369·27	3,325	287·3	
15th	369·13	3,100	267·8	
16th	368·66	2,525	218·2	
17th	368·12	1,956	169·0	
18th	367·68	1,450	125·4	
19th	367·11	930	80.3	
20th	366·74	660	57·6	
21st	366·69	620	53·6	
22nd	366·76	670	57·9	
23rd	367·23	1,050	90·7	
24th	367·26	1,060	91·6	
25th	367·17	975	84·2	
26th	367·19	1,000	86·4	
27th	367·06	850	73·4	
28th	367·26	1,060	91·6	
29th	367·33	1,110	95·9	
30th	366·96	830	71·7	
31st	366·73	655	56·6	
	Total for the month	..	6,027·5	

Note.—The "mean daily reading" is the average of four readings taken every 24 hours—at 6 A.M., noon, 6 P.M. and 6 A.M. (the following day).

All days on which the discharge is less than 300 cusecs have been omitted.

Statement No. 5.

GAUGE readings and discharges for the month of September 1907.

Day.	Mean daily reading.	Discharge in cusecs.	Discharge in 24 hours in millions of cubic feet.	Zero of gauge + 364.57.
			CUBIC FEET.	
1st	366·63	575	49·7	
2nd	366·48	490	42·3	
3rd	366·29	370	31·9	
4th	366·18	305	26·3	
5th	366·17	350	30·2	
6th	366·17	350	30·2	
7th	366·13	340	29·3	
8th	366·14	343	29·6	
9th	366·08	..	..	
10th	365·99	..	..	
11th	366·06	..	..	
12th	365·99	..	..	
13th	365·88	..	..	
14th	365·79	..	..	
15th	365·72	..	..	
16th	365·71	..	..	
17th	365·66	..	..	
18th	365·62	..	..	
19th	365·71	..	..	
20th	365·69	..	..	
21st	365·68	..	..	
22nd	365·68	..	..	
23rd	365·78	..	..	
24th	366·06	..	..	
25th	366·26	347	29·9	
26th	366·66	580	50·1	
27th	366·22	335	28·9	
28th	366·27	350	30·2	
29th	366·52	510	44·1	
30th	366·44	480	41·5	
Total for the month ..	..	..	494·2	

NOTE.—The "mean daily reading" is the average of four readings, taken every 24 hours—at 6 A.M. noon, 6 P.M. and 6 A.M. the following day.

All days on which the discharge is less than 300 cusecs have been omitted.

Statement No. 6.

GAUGE readings and discharges for the month of October 1907.

Day.	Mean daily reading.	Discharge in cusecs.	Discharge in 24 hours in millions of cubic feet.	Zero of gauge + 364·57.
			CUBIC FEET.	
1st	366·46	485	41·9	
2nd	366·56	530	45·8	
3rd	366·73	655	56·6	
4th	367·12	932	80·5	
5th	367·73	1,520	131·3	
6th	367·93	1,725	149·0	
7th	367·56	1,325	114·5	
8th	366·87	750	64·8	
9th	366·69	620	53·6	
10th	366·49	495	42·8	
11th	366·38	430	37·1	
12th	366·37	425	36·7	
13th	366·31	390	33·7	
14th	366·28	360	31·1	
15th	366·21	322	27·8	
16th	366·12	..	..	
17th	366·06	..	..	
18th	366·03	..	..	
19th	365·98	..	..	
20th	365·99	..	..	
21st	365·99	..	..	
22nd	366·07	..	..	
23rd	366·26	347	29·9	
24th	366·34	405	35·0	
25th	366·21	322	27·8	
26th	366·22	335	28·9	
27th	366·51	505	43·6	
28th	366·44	480	41·5	
29th	366·09	..	..	
30th	365·98	..	..	
31st	366·42	460	39·7	
Total for the month ..	..	..	1193·6	

NOTE.—The "mean daily reading" is the average of four readings, taken every 24 hours—at 6 A.M. noon, 6 P.M. and 6 A.M. the following day.

All days on which the discharge is less than 300 cusecs have been omitted.

Statement No. 7.

GAUGE reading and discharges for the month of November 1907.

Day.	Mean daily reading.	Discharge in cusecs.	Discharge in 24 hours in millions of cubic feet.	Zero of gauge + 364·57.
1st	367·68	1,450	125·3	
2nd	367·29	1,090	94·2	
3rd	366·94	810	69·9	
4th	367·43	1,250	108·0	
5th	368·13	1,960	169·3	
6th	368·81	2,720	236·0	
7th	368·86	2,775	239·7	
8th	368·26	2,075	179·3	
9th	367·86	1,675	144·7	
10th	367·83	1,645	142·1	
11th	367·88	1,690	146·0	
12th	367·86	1,675	144·7	
13th	367·29	1,090	94·2	
14th	366·82	720	62·2	
15th	366·29	370	31·9	
16th	..	..	..	
17th	..	..	..	
18th	..	..	..	
19th	..	..	..	
20th	..	..	..	
21st	..	..	..	
22nd	..	..	..	
23rd	..	..	..	
24th	..	..	..	
25th	..	..	..	
26th	..	..	..	
27th	..	..	..	
28th	..	..	..	
29th	..	..	..	
30th		..	..	
Total for the month ..	..	..	1,987·5	

NOTE.—The "mean daily reading" is the average of 4 readings, taken every 24 hours—at 6 A.M. noon, 6 P.M. and 6 A.M. the (following day).
All days on which the discharge is less than 300 cusecs have been omitted.

Statement No. 8.

Rainfall register at Pambiyar Station, Season 1907–1908.

Day.	1907.								1908.							
	September.		October.		November.		December.		January.		February.		March.		April.	
	IN.	CENTS.	IN.	CENTS.	IN.	CENTS.	IN.	CENTS.	IN.	CENTS.	IN.	CENTS.	IN.	CENTS.	IN.	CENTS.
1st		..	0	65	1	30		..		..		..	0	13		..
2nd		..	2	35	1	00		..		..		..		..		..
3rd		..	1	15	1	30		..		..		..		..		..
4th		..	1	60	0	25		..		..	0	15		..		..
5th		..	2	40	0	80		..		..		..		..		..
6th		..	2	15	1	60		..		..		..		..	0	40
7th		..	0	90	1	80		..		..		..		..	0	05
8th		..	0	20	1	35		..		..		..		..		..
9th		..	0	10	1	15		..		..		..		..		..
10th		..	0	65	1	80		..				..		..		..
11th		..	0	00	0	80		..	0	30		..		..		..
12th		..	1	50	2	60		..		..		..		..	0	80
13th		..		..		..	1	00		..		..		..		..
14th		..	0	70	0	10	0	85	0	05		..		..		..
15th		..	0	75		..		..	0	20		..		..	0	25
16th		..	0	05		..		..	2	15		..		..		..
17th		..	0	10		..		..		..		..	0	45	0	90
18th		..	0	25		..		..		..		..	0	20	0	10
19th		..	0	15		..		..		..		..	0	01		..
20th		..	0	10	0	60		..		..		..		..		..
21st		..	0	80		..	0	10		..		..		..		..
22nd		..	0	50		..	0	05		..		..		..		..
23rd		..	0	90		..		..		..		..		..		..
24th	1	90	0	80		..		..		..	0	45		..		..
25th	0	55	0	20		..		..		..	0	10	0	38		..
26th	2	00	0	20		..		..		..	0	02	0	30		..
27th	0	75	1	10		..		..		..		..	2	18		..
28th	1	00	0	20		..		..	0	01		..	0	08		..
29th	2	40		..	1	15		..		..	0	01	0	03		..
30th	2	20	0	15		..		..		..		..	0	01		..
31st		..	0	30		..		..		..		..		..		..
Total ..	10	80	20	90	17	60	2	00	2	71	0	73	3	77	2	50

Note.—The register was opened on the 24th September 1907, and closed on the 20th April 1908.

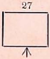
Statement No. 9.

Comparison of rainfall at Pambiyar, Periyár and Thekadi.

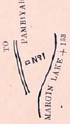
Month.	Pambiyar.		Periyár.		Thekadi.		Remarks.
	INCHES.	CENTS.	INCHES.	CENTS.	INCHES.	CENTS.	
September 1907	10	80	1	10	1	30	From 24th September 1907.
October "	20	90	15	0	10	41	
November "	17	60	10	48	12	11	
December "	2	0	1	95	2	34	
January 1908	2	71	1	20	0	70	
February "	0	73	1	50	2	20	
March "	3	77	1	70	0	73	
April "	2	50	2	80	2	18	Till 19th April 1908.
Total ..	61	01	35	73	31	97	

Description of the positions of certain Prominent Bench Marks left by the Periyár-Pambiyar Investigation party.

General.—Twenty-seven Bench Marks in all were left by the party, all of them cut upon rocks. Each mark consists of a recessed square, in which the staff is to be placed with the broad arrow below and the number of the Bench Mark above, thus :

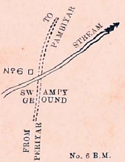


In the following descriptions, when alluding to the right or left sides of the foot-path, that side of the path is referred to which a person proceeding from the lake to the Pambiyar river would have upon his right or left hand respectively—



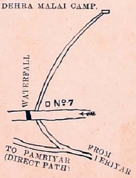
No. 1 B.M.

No. 1 *Bench Mark.*—On the top of a prominent large boulder, on the right-hand side of the foot-path, and between the path and the margin of the lake when at full lake level.



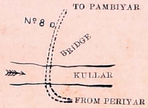
No. 6 B.M.

No. 6 *Bench Mark.*—On a rock on the left-hand side of the foot-path, immediately after crossing the first stream which is reached after crossing the watershed in the valley between the lake and Dehra Malai camp.



No. 7 B.M.

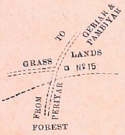
No. 7 *Bench Mark.*—On a piece of sheet rock on the right-hand side of the path which leads up the hill to Dehra Malai camp and close to the small waterfall on the stream at the foot of the hill : Bench Mark on the camp side of the stream.



No. 8. B.M.

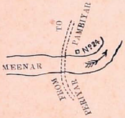
No. 8 Bench Mark.—On a piece of sheet rock on the left-hand side of the path, above 200 yards from the southern margin of the Kullar.

No. 14 Bench Mark.—On an outcrop of sheet rock over which the path passes a short distance before it emerges from the belt of forest between the Dehra Malai and Gebiar camps on to the Gebiar grass lands.



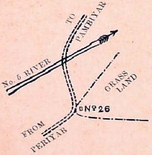
No. 15 B.M.

No. 15 Bench Mark.—On a piece of sheet rock on the right-hand side of the path immediately after emerging from the forest between Dehra Malai and Gebiar camps on to the Gebiar grass lands: also at the junction of two foot-paths.



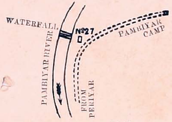
No. 24 B.M.

No. 24 Bench Mark.—On a rock on the south margin of the Meenar on the right-hand side of the foot-path.



No. 26 B.M.

No. 26 Bench Mark.—On a prominent rock on the right-hand side of the foot-path where the path through the belt of forest between Gebiar and Pambiyar camps first touches grass lands before finally emerging from the forest at the Pambiyar river.



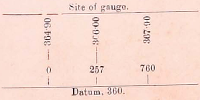
- No. 27 B.M.

No. 27 Bench Mark.—On the extensive outcrop of rock over which the path passes before reaching the Pambiyar camp: on the left side of the path and just above the waterfall on the Pambiyar river below the camp.

V

Memorandum No. 51-O., dated 22nd May 1908.

In connection with the Pambiyar investigation the Chief Engineer for Irrigation has the honour to request the Superintending Engineer, VI Circle, to continue the gaugings made last year of the Pambiyar river. The Executive Engineer should be directed to appoint two gaugers with as little delay as possible. The site of the existing gauges is believed to be only some 30 feet from the edge of a precipice and probably the depth is affected by the draw at this point; also the longitudinal section sent by Mr. Murray is as noted in the margin.



The discharges have been calculated on a bed fall of 3 feet in 760 or 0·0039, but the fall immediately above the gauge is 1·1 in 257 or 0·0043, it may be objectionable to place the gauges too far up stream as the depth there may be affected by the fall and bends above; but it would seem that if the average fall is to be used in calculation, the gauges should be fixed 200 to 250 feet above the present site.

The automatic recorder may be fixed next cold weather at this point and arrangements should be made in good time for collecting the required materials.

C. A. SMITH,
Chief Engineer for Irrigation.

To the Superintending Engineer, VI Circle

VI

Note by the Chief Engineer for Irrigation.

The investigation during the past season has been carried out on the lines proposed in Mr. Murray's previous report paragraph 7, although time did not permit of that programme being fully worked out. It will also be seen from the present report that in consequence of an opinion which, it is understood, was expressed personally to the Acting Chief Engineer for Irrigation (Mr. H. E. Clerk) by the Inspector-General of Irrigation (Mr. J. Benton, C.I.E.) that the cost of the tunnel proposed by Mr. Murray would be prohibitive, investigations were stopped somewhat abruptly.

The results of the investigation may be briefly summarised thus :—

That it is possible to divert Pambiyar water into the Periyár lake, but that the following works will be required :—

(a) A masonry dam on the Pambiyar from which water would be led by an open channel into the Meenar valley, use being made of No. 5 river, a tributary of the Pambiyar for the purpose.

(b) A low dam on the Meenar and a tunnel rather less than three miles long from it into the Kullar valley.

(c) A dam on the Kullar with an open channel from it into the Periyár catchment.

2. For the reasons given above, the exact length of the tunnel and the section along the line were not taken, and as the Inspector-General also decided that no further investigation should be made to ascertain the catchment areas of the Pambiyar and Kullar rivers, it is not at present possible either to frame an estimate of any value of the probable cost of diverting water or to form any idea of the quantity of water available in these rivers.

3. The results of the gauging of the Pambiyar river for five months given in the statements indicate the probability of a good supply in that river, and from the position of the gauge and the method adopted in calculating the discharges, it is believed that they have been considerably underestimated. Orders have been sent to the Executive Engineer to arrange for the gauges to be read throughout the current year, and as soon as weather permits an automatic recorder will be fixed and the gaugings continued for a series of years. The gaugings for 1907 cannot be made use of by themselves as the year was a favourable one and above the average.

4. Also as regards the rainfall, it is not advisable to lay much stress on the comparative statement No. 9 as it is known that the rainfalls gauged at Periyár and Tekkadi are not correct indications of the fall further up the valley where it is heavier.

5. It is not known why the Inspector-General apparently condemned any tunnel scheme, but presumably on the ground of expense ; but while it is not possible at present to make any definite proposals and, therefore, no arguments can be adduced against such a condemnation, the Chief Engineer for Irrigation is of opinion that the results of the investigation do not justify the final abandonment of the scheme at present and that the question must necessarily lie over until gaugings have been taken for a sufficient number of years to enable the quantity of water available in the Pambiyar to be estimated and the use, which could be made of it to supplement the Periyár, ascertained.

6. In connection with the proposals recently under consideration with regard to the conservation of the forests in the Periyár catchment, the desirability of having the catchment surveyed by the Government of India, Survey Department, has again been brought to notice and if this is carried out, that of the Pambiyar might well be done at the same time in which case it might be possible to decide upon the practicability of the Periyár-Pambiyar scheme at an earlier date than if the result of gaugings has to be awaited.

12th June 1908.

C. A. SMITH,
Chief Engineer for Irrigation.

Order—No. 226 I., dated 17th June 1908.

The Government accept the opinion of the Chief Engineer for Irrigation that further investigation of the Pambiyar scheme must be deferred until gaugings of the river are available for a sufficient number of years to enable a reliable estimate to be formed of the quantity of water available and the use which could be made of it if diverted into the Periyár.

Arrangements will accordingly be made by the Superintending Engineer, VI Circle, to continue the gaugings.

A copy of these Proceedings will be forwarded to the Government of India for information with reference to their letter No. 575 I., dated 4th May 1906.

[Here enter No. 227 I., dated 17th June 1908.]

(True Extract.)

C. A. SMITH,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Chief Engineer for Irrigation.
,, Superintending Engineer, VI Circle.
,, Examiner, Public Works Accounts.
,, Revenue Department.
,, Chief Engineer, Public Works Department.

Endorsement—No. 227 I., dated 17th June 1908.

Forwarded.

(By order.)

C. A. SMITH,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

PUBLIC WORKS DEPARTMENT
(IRRIGATION BRANCH).

NOTES CONNECTED WITH G.O., No. 226 I., DATED 17TH JUNE 1908.

[SUBJECT.—*Report showing the results of the working of the Periyár-Pambiyar Investigation Party during the current working season.*]

From the Executive Engineer, Periyár-Pambiyar Investigation, dated 3rd March 1908, No. 125.

Under Secretary—

Submitted for orders.

S. A. VENKATARAMIER.
13-3-08.

S. DURAISAWMI AIYAR.
13-3-08.

T. W. S. SMYTH.
14-3-08.

Send me the map which should accompany G.O., No. 280 I., dated 18th June 1907.

H. E. CLERK.

Joint Secretary through Under Secretary—

The map is filed with the original Government Order.

S.D.
14-3-08.

T.W.S.S.
16-3-08.

Send this file to camp. I want to show Inspector-General.

H.E.C.
16-3-08.

To the Exe. Eng., Periyár-Pambiyar Investigation, dated 23rd Mar. 1908, No. 1274.
From the ,, ,, ,, Telegram dated 10th April 1908.

Under Secretary—

Mr. Murray's reports of last year's operations and those of the current year were shown to the Inspector-General, who considered that all further attempts to trace the rivers to their sources and thus determine their catchment should be abandoned and that our estimate of supply available must be based on gaugings. Mr. Murray was accordingly requested to have gaugings recorded in a trustworthy manner, but as he expressed difficulties in the way of setting up a recorder this season he was informed in Memorandum No. 1530, dated 9th April 1908, that no attempts need be made to build a gauge-house this season and that the question of erecting one next year will be considered and orders passed.

2. The Inspector-General was of opinion that the line of tunnel marked on the plan filed with G.O., No. 280 I., dated 18th June 1907, recording the report showing the work of the party from November 1906 to April 1907 was prohibitively expensive and suggested that a contour channel, the rough line of which was indicated in the above plan, be made starting at a suitable level on the southern side of the water-shed between the lake and the Kullar and working with a rising contour along the slope of the "great ravine" until the Pambiyar was reached. Mr. Murray was requested to try and see whether this suggestion was feasible; and, if not, to explain clearly.

3. Mr. Murray, in his telegram, dated 10th instant, states that a contour channel is impracticable and that it must be a tunnel or nothing. Detailed explanation as to how a contour channel is not practicable, has not been given.

For orders.

S.D.
11-4-08.

T.W.S.S.
11-4-08.

Write to the Executive Engineer and ask him to explain why a contour channel is impracticable.

Joint Secretary—
Submitted.

G.V.
20-4-08.

File back to me after despatch.

C. A. SMITH.
16-4-08.

Under Secretary—

Draft memorandum submitted for approval.

G.V.
17-4-08.

T.W.S.S.
17-4-08.

[Issued as No. 3/O., dated 19th April 1908.]

From Mr. S. B. Murray, Executive Engineer, Periyár-Pambiyar Investigation, dated 1st May 1908, No. 142.

Under Secretary—

Submitted for orders.

B.G.R.
4-5-08.

It is rather a pity that the Inspector-General would have nothing to say to the tunnel. The discharges are much higher than would have been expected from the gaugings, as the water seldom reached the gauge first fixed under Mr. Murray's instructions and a lower one had to be fixed.

Mr. Murray threw doubt on their trustworthiness.

The year 1907 was one of very high discharges. The annual diagram of the Periyár would not yet have reached this office. The Superintending Engineer will be asked to expedite it so that a comparison may be made and an estimate of the probable discharge in the Pambiyar in a bad season which is the important thing.

The storage capacity on the Pambiyar is very small, 581 millions cubic feet, the dam will be little more than a diversion dam and the tunnel would have to discharge 2,000 cusecs to make good use of the water; still it seems possible that if the Pambiyar can be depended upon to increase the supply in the Periyár in the worst year to that of a good average year the work might be worth carrying out.

It might also be worth while to divert the Kullar river only; this would be a comparatively small work and it is recommended that the gauging of this river should be put in hand and that of the Pambiyar continued.

Mr. Murray states that the supply in this stream is of no importance.

T.W.S.S.
5-5-08.

Note for His Excellency—

From Chief Engineer for Irrigation's No. 1274, dated 23rd March 1908, it is understood that the Inspector-General informed the Acting Chief Engineer for Irrigation, Mr. H. E. Clerk, that he considered that a tunnel on the line proposed by Mr. Murray would be prohibitive and Mr. Murray was asked to report whether a contour channel would not be practicable. In his No. 141, dated 28th April 1908, Mr. Murray states that a contour channel on the line marked by the Inspector-General on the map would be quite impossible and he criticises the Inspector-General's line in detail.

The line marked was of course only a rough indication of a suggestion which, if found practicable, might obviate the necessity for a tunnel and was not intended to be rigidly adhered to.

However, I have since discussed the matter with Mr. Murray who informed me that he had personally been over as much of the country lying between his proposed line and the Great Ravine as was accessible and that between all the different rivers there are very high ridges which all have a very steep fall towards the Great Ravine and all end in high precipices and that he is quite confident that no contour line skirting the Great Ravine is at all practicable and that, therefore, the only means of diverting Pambiyar water into the Periyár is by a tunnel as originally proposed. He has only sent one section, *i.e.*, that along the bed of the Meenar to support his opinion, but for the present at any rate his conclusion must be accepted.

I am not aware of the reasons which have induced the Inspector-General to condemn finally a tunnel scheme, but I presume this conclusion of his must be based entirely on the great cost of tunnelling. However, we are not in a position to argue against it at present and we could only do so by means of figures showing that we could by means of a tunnel increase the supply of the Periyár reservoir in such a way as either to enable the power scheme to be carried out or to obtain a large increase of the irrigated area and in either case we must necessarily make the scheme productive on paper. Before we can do anything in this direction, we must estimate the quantity of water available from the Pambiyar and since the Inspector-General is against any further investigation to fix the actual catchment area, the estimate of water available can only be made by gauging the river itself. Mr. Murray has submitted gaugings for five months in 1907 which are satisfactory as far as they go and from Mr. Murray's personal description of the site of the gauge which is said to be only about 30 feet above the waterfall, it is most probable that the calculated discharges are considerably underestimated.

These gaugings have, however, been taken in a favourable year and cannot be used by themselves. These gaugings and the comparative statements of rainfall tend to show that a good supply is likely to be available in the Pambiyar, but too much stress must not be laid on the comparison of rainfall between Pambiyar and Periyár and Thekkady as it is well known that the latter two stations do not give a correct indication of the rainfall in the Periyár catchment which is certainly heavier than that at either of these two stations.

All that we can do at present, therefore, is to arrange for systematic continuous gauging of the Pambiyar for a sufficient number of years to enable a reliable estimate to be made of the quantity of water available and the use which could be made of it if diverted into the Periyár.

It may be noted that in connection with the proposals for conserving the forests in the Periyár catchment, the Committee recommended that the catchments should be surveyed.

The Government of India Survey Department was asked to undertake this two years ago but were unable to do so; but if it is decided to do this we might be able to settle whether the Pambiyar scheme is worth further detailed investigation without waiting for the gaugings of that river.

Vide G.O., No. 958 I., dated 7th September 1906.

In the meantime a report in the form of a copy of Mr. Murray's report with a note on it by the Chief Engineer for Irrigation may be made to India of the result of the investigation up to date and I submit that India should be informed that although we are not at present in a position to argue against the Inspector-General's opinion that a tunnel scheme will be impracticable for want of sufficient data, we consider that the results of the present investigation do not justify the abandonment of the scheme and that a further reference will be made as soon as gaugings which are proposed to be continued have been taken for a sufficient number of years to enable a reliable estimate to be made of the water available and the probable results of diverting it into the Periyár.

In reply to paragraph 12 of Inspector-General's note printed on pages 3 and 4 of G.O., No. 702 I. of 27th June 1906.

C.A.S.
22-5-08.

Proposed communication to India is approved.

A. L[AWLEY].
1-6-08.

G. S[TOKES].
2-6-08.

Under Secretary—

For orders whether the draft order kept below should be circulated to His Excellency and the Hon'ble Mr. Stokes or whether it may issue.

B.G.R.
10-6-08.

T.W S.S.
10-6-08.

Note for His Excellency—

The proposed communication to India has been already approved by His Excellency. Draft order is submitted for approval.

C.A.S.
10-6-08.

A. L[AWLEY].
11-6-08.

Under Secretary—

Submitted that the draft order may now issue.

G.V.
12-6-06.
B.G.R.

Issue.

T.W.S.S.
12-6-08.

[Issued as G.O., No. 226 I., dated 17th June 1908.]

No 1274 923 3 08

6 To S.E. P.P. Investigation
Ref. his No 125. of 3.3.08

C 1673/08

2-5-08

4P

Mr. Murray's reports of last years operations as well as that of the current year have been shown to the I.G. of Irrigation. He considers that all further attempts to trace rivers to their sources and to determine the catchment should be abandoned. Our estimate of supply available must be based on gaugings of the rivers and special arrangements must be made to have these recorded in a trustworthy manner.

Encl plans to be returned

2. The line of tunnel sketched in the plan which accompanied his No 20 E1 dated 20-4-07 is considered to be prohibitively expensive if the levels marked on that plan are at all correct.

G.O. No 2801 d/18.6.08

M

DESPATCHED
DATE 23.3.1908
ENCLOS. 1

3. The I.G. suggests that a contour channel might possibly be made starting at a suitable level ~~below there~~ on the southern side of the watershed between the lake and the Kullar and working with a rising contour along the slopes of the "Great Ravine" until the Pambiar is reached. The nature of the country may make such a line ~~prohibitive~~

a pencil line, only the plan indicates roughly the line suggested.

herewith returned

INDEXED

3

impossible, but if it is so, it should be clearly explained.

In conclusion the a/s wishes again to impress on Mr. Murray that the main object of his investigation is to increase the supply to the Penjan reservoir. Any question of increasing the storage capacity is a secondary consideration.

HC
19/3/08

DD
KS

T

Sur
[illegible]

HD Please see that this is [illegible]
[illegible]
23/3

3

Stock Form No. 141 (a).
4,000—19-4-07.

PAGE 8

PUBLIC WORKS DEPARTMENT.

Irrigation Branch.

CURRENT No. 2455

ENCLOSURES. Plans No.
Others No.
Total

Received 10 . 4 1908.

Registered 190

Passed on by Registering Clerk ...
" " U. R. Clerk ...
" " Record-keeper ...
" " Drafting Officer ...

SPARE COPIES.

Subject.

Any contour channel is impracticable, it must be a tunnel or nothing — Wires that —

No. Telegram

Station , *Dated the* 10 . 4 1908

From (Name) Murray

(Designation) Kumili Travancore.

To ~~The Chief Engineer~~ / *The Joint Secretary* *to the Government of Madras,*

Public Works Department,

Irrigation Branch.

Sir,

Urgent

Papers at once

10/4/08

4

PAGE 9

C. INDIAN TELEGRAPHS. No. of Telegram

NOTICE.

This form must accompany any inquiry made respecting this Telegram.

Charges to pay.		Office Stamp.
Rs.	As.	10 . 08

Handed in at	Office of Origin.	Hour.	Minute.	Service Instructions.
	Kumili Periyar	13	5	State ordy

TO Madras Irrigation
Madras Chepauk

Your number 1274 any Contour channel impracticable it must be a tunnel or nothing

Wm Murray

N.B.—The name of the Sender, if telegraphed, is written after the text.

10 5

PUBLIC WORKS DEPARTMENT,

IRRIGATION BRANCH.

No 36 d/19 4. 08

Memo

With reference to his telegram dated 10 instant, the Executive Engineer, Periyar-Pambiar Investigation is requested to be so good as to give detailed explanation as to why a Contour Channel will be impracticable

M.S.

17/11.

Gv
17. 4. 08

Despd
19. 4. 08

To the Ex: Engineer
Periyar Pambiar Investgn

~~5~~ 6 //

Stock Form No. 141 (a).
4,000—19-4-07.

PUBLIC WORKS DEPARTMENT.

Irrigation Branch.

CURRENT No. 2912

ENCLOSURES. Plans No. 2 / Others No. / Total 2

Received 1 · 5 1908

Registered 190

SPARE COPIES.

Passed on by Registering Clerk ...

" " U. R. Clerk ...

" " Record-keeper ...

" " Drafting Officer ...

Subject.

Reply to E-S's memo No 1274 d/23.3.08 — Submits a — clearly explaining the impossibility of a line for a contour channel from the Pambiyar river to the Periyar lake, & stating also that he has described what work had been done on tracing "rivers to their sources," in his Report submitted with his letter No 142 d/1.5.08 —

No. 140

Station , Dated the 28 · 4 1908

From (Name)

(Designation) E. E. Periyar. Pambiyar Investigation

To The Chief Engineer / The Joint Secretary to the Government of Madras,

Public Works Department,

Irrigation Branch.

Sir,

V. urgent

C.S.

Urr [illegible] to Costy [illegible]

[illegible] 5

7 ~~11~~/12

Chepauk, 28th April 1908.

No.140.

78

From

S. B. MURRAY Esq.,

Executive Engineer, Periyar-Pambiyar

Investigation Party.

To

The Chief Engineer for Irrigation.

Sir,

File with Encl. 2 pp 67 of file

I have the honour to reply to your Memo No. 1274/23-3-08 I have not been able to do so earlier as my answer has to be read with the map which accompanied your Memo. under reference, and this map was wanted to enable me to prepare my Report on the work of the Party for the present season It is now returned.

2. In my Report submitted with my letter No. 142/1.5.08. I have described what work had been done on tracing "rivers to their sources" before the receipt of your order, and the action I took on the receipt of your order. I have also discussed at length the tunnel question, so further reference to these points is not here necessary. I should however, like to point out in connection with the remark about the levels being "at all correct", that if I had not been sure that the levels were correct I should not have allowed them to appear on a plan bearing my signature.

As to the line for a contour channel from the Pambiyar river to the Periyar lake, which has been proposed by the Inspector General of Irrigation I can say at once that the line proposed is impossible, and I shall now proceed to clearly explain why it is so.

(As a pencil line is not likely to be a permanent record I have inked in (red chain line) Mr. Benton's pencil line.)

Starting from the right bank of the Pambiyar river the

6

13 ~~15~~ 2.18

line begins at a place where there is very high ground above the river. I have not considered it necessary to take levels, but I can safely say that the ridge between the Pambiyar and No.5 River is at least 300 feet high. This ridge extends to the north-west almost up to where No.5 River joins the Pambiyar. The slope of the hill side is far too steep to admit of a contour channel being taken round into the "No.5 River" valley, so a tunnel would be required at the very start. Mr. Benton has drawn his line straight across No.5 River valley. This of course is an impossible line for a contour channel. The correct line would be up and round the valley, but here again the slope of the ground is too steep for a contour channel. The line next passes under a hill, on which survey station No.22 has been placed, where another tunnel would be required. It then goes through a saddle, and crosses the Meenar river. I submit a section *down the bed of this river, from B.M. No.24 to where it falls into the great Ravine. I have marked on this section the point approximately, where Mr. Benton's line crosses it. The Meenar below B.M. No.24 flows through what is practically a gorge, and no channel of any kind could be built along the sides of it. Beyond the Meenar there are high hills through which Mr. Benton's line would go. His line is then drawn across the great Ravine, which is at least 800-1000 feet deep at this place. On the north side of the Ravine the line meets what is literally a precipice, and here I think I may stop further detailed criticism of the proposal, which would never have been made if the country had been once seen.

*bedfall 1-16

I have the honour to be,

Sir,

Your Most Obedient Servant,

S. W. Murray

Executive Engineer, Periyar
Pambiyar Investigation Party.

KuB.

3
RoC 55-8 26-8

PERIYAR - PAMBIYAR INVESTIGATION

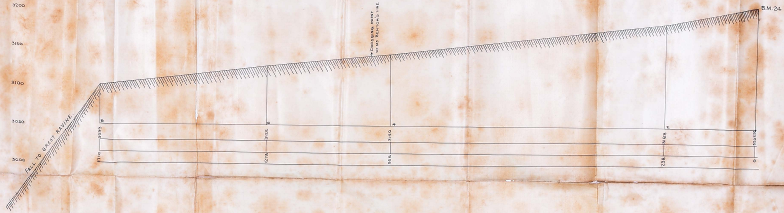
PLAN AND LONGITUDINAL SECTION OF THE MEENAR FROM BENCH MARK № 24 NEAR THE PERIYAR PAMBIYAR FOOTPATH

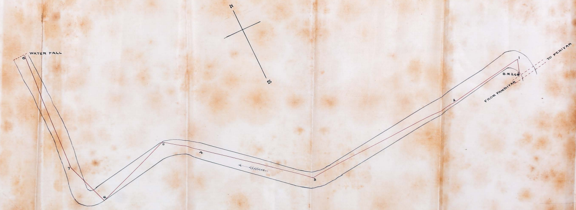
TO THE WATERFALL AT THE HEAD OF THE GREAT RAVINE

SCALE

FOR SECTION { HORIZONTAL $^1/_{1000}$ — VERTICAL $^1/_{500}$

FOR PLAN — $^1/_{1000}$





(Signed) [illegible]
30.4.05
Ex: Engineer.
Periyar - Pambiyar Investigation.

Periyar Lake
Periyar Lake
Salt Lick Creek
Talapancira Creek
Grass Land
Edge of Big Jungle
Periyar River
Delra Malai Camp
Kullar Waterfall
Kullar
Watershed Line
Great Ravine
Gebiar Camp
Gebiar Waterfall
Gebiar
Pambiyar Waterfall
No 4 River
Meenar
No 5 River
Pambiyar Camp
Watershed
Base Line
Great Ravine
Pambiyar
Source
Waterfall
Waterfall
PERIYAR-PAMBIYAR INVESTIGATION
Map
shewing fieldwork done during the
Working Season of 1906-07
Scale: 2 ins = 1 mile
References.
Footpaths shewn thus
Watershed Lines (Approx.) "
Forest Boundaries (Approx) " Grass Forest
Cut Bench Marks (M.S.L.) " ▲27. 3223·69
Streams partially explored
but unsurveyed distinguished thus Kullar; Triby.
Level of Escape, Periyar Lake (1907), 2981·36

14 11

Stock Form No. 141 (a).
4,000—19-4-07.

PUBLIC WORKS DEPARTMENT.

Irrigation Branch.

CURRENT No. 2848

ENCLOSURES. Plans No.
Others No.
Total

Received 29. 4 1908

Registered 190

SPARE COPIES.

Passed on by Registering Clerk ...
" " U. R. Clerk ...
" " Record-keeper ...
" " Drafting Officer ...

Subject.

Detailed explanation as to why a Contour channel is impracticable — Informing that he has prepared a — but cannot send it at pre= as he requires the map which enables him to prepare the Report on the work of the party for the present working season, and also stating the reason of his telegraphing on the 10th Ap.

No. 141

Station , Dated the 28 · 4 1908

From (Name)

(Designation) E. E. ~~Cauvery Reservoir Project~~ Periyar Pambiyar Investigation

To The Chief Engineer / The Joint Secretary to the Government of Madras, ~~for~~

Public Works Department,

Irrigation Branch.

Sir,

Tele with E?

H.C / C

[illegible]

[illegible] 30/4

12 ~~12~~ ~~15~~

Chepauk, 28th April 1908.

No.141.

From

S. B. MURRAY Esq.,

Executive Engineer, Periyar-Pambiyar

Investigation Party.

To

The Chief Engineer for Irrigation.

Sir,

I have the honour to inform you, with reference to your Memo. No.3-0, dated 19th April 1908, that I have prepared a detailed explanation as to why a contour channel is impracticable, but that I am not able to send it to you at present as I require the map, which accompanied your letter, to enable me to prepare my Report on the work of the Party for the present working season. As soon as I have finished my Report I will send you my explanation, with the map.

2. My reason for telegraphing to you on the ~~18th~~ 10th of April was that, at that time, you had under consideration the advisability of erecting a gauge House on the Pambiyar River, and I thought it might help you to arrive at a decision if you knew definitely that the long tunnel objected to by Mr. Benton was a necessary part of the scheme.

p 10 file

I have the honour to be,

Sir,

Your Most Obedient Servant,

S. B. Murray

Executive Engineer, Periyar
Pambiyar Investigation Party.

K.B.

Subject Report showing the results of the Periyar - Pambiar Investigation Party from 1907 to April 1908.

CURRENT No. 5583

Public Works Department

Irrigation Branch.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

G O No 702 I d/ 27-6-06

G O No 280 I d/ 18-6-07

Enc { 6 plans / 7 others / 13

Read the following

From the Executive Engr. Pambiyar-Periyar Investign. Party,		No. 125, d/3-3
To		1274, d/23-3-08
Telegram from		dated 10-4-08
To	No 3 O,	dated 19-4-08
From		No. 140, d/28-4-08
From		141, d/28-4-08
From		142, d/1-5-08
To		51-0, d/22-5-08

Note by the Chief Engineer for Irrigation.

The investigation during the past season has been carried out on the line proposed in Mr. Murray's previous report para 7 although time did not -- permit of that programme being fully worked out. It will also be seen from the present report that in consequence of an opinion which it is understood, was expressed personally to the Ag. Chief Engineer for Irrigation (Mr. H. E. Clerk) by the Inspector General of Irrigation (Mr. J. Benton C.I.E) that

Issue 12/6/08

30

the cost of the tunnel proposed by Mr. Murray would be prohibitive investigations were stopped somewhat abruptly.

The results of the investigation may be briefly summarised thus:—

That it is possible to divert Pambiyar water into the Periyar lake, but that the following works will be required

(a) A masonry dam on the Pambiyar from which water would be led by an open channel into the Meenar -- valley, use being made of No.5 river, a tributary of the Pambiyar for the purpose.

(b) A low dam on the Meenar and a - tunnel rather less than three miles long from it into the Kullar valley

(c) A dam on the Kullar with an open channel from it into the Periyar catchment.

2. For the reasons given above, the exact length of the tunnel and the - section along the line were not taken and as the Inspector General also de- cided that no further investigation

15

should be made to ascertain the catchment areas of the Pambiyar and Kullar rivers, it is not at present possible either to frame any estimate of any value of the probable cost of diverting water to form any idea of the quantity of water available in these rivers.

3. The results of the gauging of the Pambiyar river for five months given in the table indicate the probability of a good supply in that river and from the position of the gauge and the method adopted in calculating the discharges, it is believed that they have been considerably underestimated. Orders have been sent to the Executive Engr. to arrange for the gauges to be read throughout the current year and as soon as weather permits an automatic recorder will be ~~issued~~ fixed and the gaugings continued for a series of years. The gaugings for 1907 cannot be made use of by themselves as the ~~North East~~ year ~~monsoon~~ was a favourable one and above the average.

Lp 25-27 file

4. Also as regards the rainfall, it is not advisable to lay much stress on the comparative table No. 9 as it is - known that the rainfalls gauged at Periyar and Tekkadi are not correct indications of the fall further up the valley where it is heavier.

5. It is not known why the Inspector General apparently condemned any -- tunnel scheme, but presumably on the ground of expense, but while it is not possible at present to make any definite proposals and, therefore, no arguments can be adduced against such a a condemnation, the Chief Engineer for Irrigation is of opinion that the results of the investigation do not - justify the final abandonment of the scheme at present and that the question must necessarily lie over until gaugings have been taken for a sufficient number of years to enable the quantity of - water available in the Pambiyar to be estimated and the use, which could be

be made of it to supplement the Periyar, ascertained.

6. In connection with the proposals recently under consideration with -- regard to the conservation of the forests in the Periyar catchment, the desirability of having the catchment surveyed by the Government of India, Survey Dept has again been brought to notice and if this is carried out, that of the Pambiyar might well be done at the same time in which case it might be possible to decide upon the practicability of the Periyar Pambiyar scheme at an earlier date than if the result of gaugings has to be awaited.

Irrgn

11.6.08

ORDER No 226-9 D 17-6-08

The Government accept the opinion of the Chief Engineer for Irrigation that further investigation of the -- Pambiyar scheme must be deferred until gaugings of the river are available for a sufficient number of years to enable

a reliable estimate to be formed of the quantity of water available and the use which could be made of it if diverted into the Periyar.

Arrangements will accordingly be made by the Superintending Engineer, VI Circle to continue the gaugings.

A copy of these Proceedings will be forwarded to the Government of -- India for information with reference to their letter No. 575 I d 4-5-1906

Z

Endorsement No. 227-I, dated 17-6-08

DESPATCHED 21 OCT 1903

F o r w a r d e d.

D.I. 6/6/08

6/6/08

Ordinary Press

To the Chief Engr. for Irrgn
" Supg. Engr. VI Circle
" Examiner P.W. Accounts
" Revenue Department
" Chief Engr. P.W.D.

DESPATCHED 21 OCT 1903

4-6-08

35

SHEET No 1.
PERIYAR-PAMBIYAR INVESTIGATION
Map
shewing fieldwork done during the
Working Season of 1907-08.
Scale: 2 ins-1 mile
Ex: ENGINEER.
PERIYAR: PAMBIYAR INVESTIGATION.
References.
Footpaths shewn thus
Watershed Lines (Approx) "
Forest Boundaries (Approx) "
Grass
Forest
Cut Bench Marks (M.S.L.) "
27. 3223·69
Streams partially explored
but unsurveyed distinguished thus *Kullar; *Triby.
Level of Escape, Periyar Lake (1907), 2981·36
Periyar Lake
Talapanaru Creek
Periyar Lake
Periyar River
Grass Land
Edge of Big Jungle
Watershed Line
Dehra Malai Camp
Kullar Fall
Great Ravine
Kullar
Watershed Line
SURVEY STATION No 9
Gebiar
LINE OF TUNNEL
No 4 River
Meenar
SURVEY STATION No 22.
PAMBIYAR DAM
No 5 River
Pambiyar Camp
Pambiyar Waterfall
Watershed
Great Ravine
Triby
Pambiyar
Source
Waterfall
Large Triby
Small Triby

SHEET No. 2.

PERIYAR - PAMBIYAR INVESTIGATION

KULLAR RIVER

CROSS SECTION OF RIVER

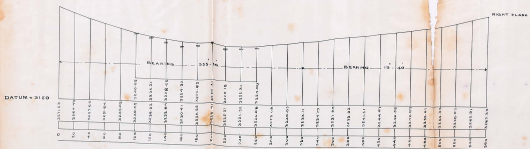
AT

PROPOSED SITE FOR DAM

SCALE 1/500

PAMBIYAR ESCAPE

SCALE 1/500



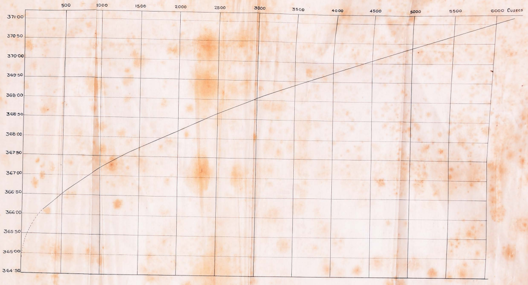
1.5.05
Ex: ENGINEER
PERIYAR - PAMBIYAR INVESTIGATION.

PAMBIYAR RIVER

FLOOD DISCHARGES CALCULATED BY KUTTER'S FORMULA

DISCHARGE CURVE

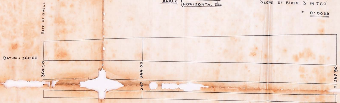
SCALE { VERTICAL $\frac{1}{12}$ FOR WATER LEVELS; HORIZONTAL $\frac{1}{500}$ FOR DISCHARGES IN CUSECS



LONGITUDINAL SECTION UP PAMBIYAR RIVER ABOVE GAUGE

SCALE { VERTICAL $\frac{1}{100}$; HORIZONTAL $\frac{1}{1000}$

SLOPE OF RIVER 3' IN 760'
= 0·0039



NATURE OF BED

SHEET ROCK, VERY SMOOTH AND REGULAR, NO LOOSE ROCKS, BOULDERS, OR VEGETABLE GROWTH—COURSE, STRAIGHT.

COEFFICIENT FOR ROUGHNESS (N), IN KUTTER'S FORMULA TAKEN TO BE = 0·025

LEVEL	AREA OF CROSS SECTION (A)	WETTED PERIMETER	MEAN HYDRAULIC RADIUS (r)	$\sqrt{r}$	C	$\sqrt{rs}$	V	DISCHARGE IN CUSECS (Q)
371·12	600	127·5	4·706	2·169	77·087	·135	10·407	6244
370·62	541·5	122·5	4·420	2·102	76·288	·131	9·993	5411
370·12	485	[illegible]	4·084	2·021	75·277	·126	9·485	4600
369·12	374	111·5	3·354	1·831	72·683	·114	8·296	3102
368·62	323	107·5	3·005	1·733	71·206	·108	7·690	2483
368·12	275·5	103·5	2·661	1·631	70·299	·101	7·100	1956
367·62	224	101	2·218	1·489	67·037	·093	6·234	1396
367·12	175·5	98·5	1·791	1·338	64·032	·083	5·315	932
366·72	130	95	1·368	1·169	60·186	·073	4·393	571
366·12	84	92	0·913	0·955	54·390	·059	3·209	269

(1) $Q = AV$

(2) $V = C\sqrt{rs}$

(3) $C = \dfrac{\left(41{\cdot}6 + \frac{1{\cdot}811}{N} + \frac{{\cdot}00281}{s}\right)\sqrt{r}}{\sqrt{r} + \left(41{\cdot}6 + \frac{{\cdot}00281}{s}\right)N}$

$N = 0{\cdot}025$

$S = 0{\cdot}0039$

$\therefore\ C = \dfrac{114{\cdot}76\sqrt{r}}{\sqrt{r} + 1{\cdot}06}$

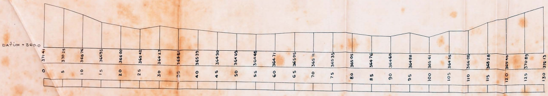
NOTES

THE LEVELS ON THIS SHEET REFER TO THE PERIYAR LAKE GAUGE DATUM. TO CONVERT THEM TO MEAN SEA LEVELS, ADD + 2837·36

THE ZERO POINT OF THE GAUGE IS AT LEVEL + 364·57

CROSS SECTION OF PAMBIYAR RIVER AT SITE OF GAUGE

SCALE $\frac{1}{100}$



[signature]
1·5·05
EX. ENGINEER

PERIYAR - PAMBIYAR INVESTIGATION.

PERIYAR - PAMBIYAR INVESTIGATION

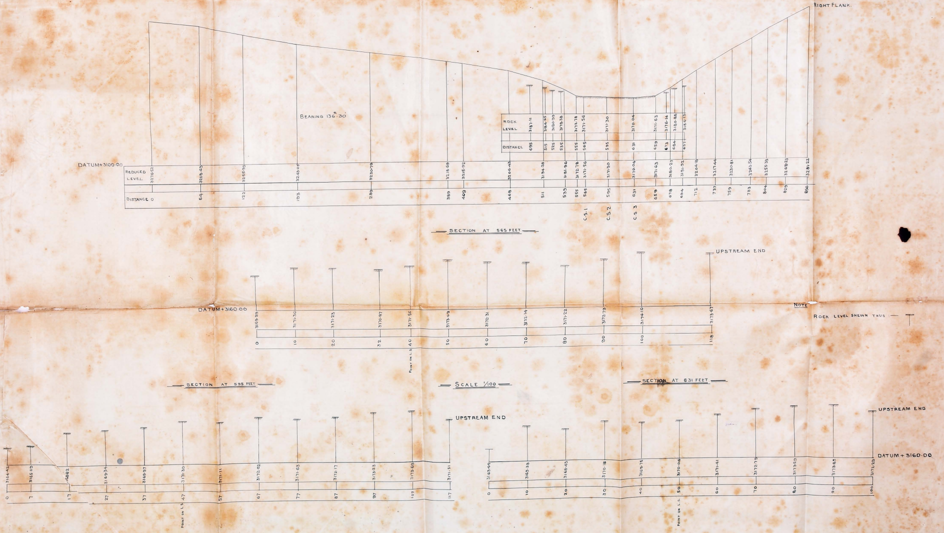
PAMBIYAR RIVER

CROSS SECTION OF RIVER

AT

PROPOSED SITE FOR DAM

SCALE 1/500



1.5.08

Ex. ENGINEER

PERIYAR - PAMBIYAR INVESTIGATION

...n for copying
...opied ______ } 191 .
...amined ______
...ned ______

...AGAIN G.O. No. . DATED
191 .

...RRENT No.

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